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Brain Controlled Car for Disabledusing Artificial Intelligence

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ABSTRACT

This paper considers the development of a brain driven car, which would be of great help to the physically disabled people. Since these cars will rely only on what the individual is thinking they will hence not require any physical movement on the part of the individual. The car integrates signals from a variety of sensors like video, weather monitor, anti-collision etc. it also has an automatic navigation system in case of emergency. The car works on the asynchronous mechanism of artificial intelligence. It's a great advance of technology which will make the disabled, abled. In the 40s and 50s, a number of researchers explored the connection between neurology, information theory, and cybernetics. Some of them built machines that used electronic networks to exhibit rudimentary intelligence, such as W. Grey Walter's turtles and the Johns Hopkins Beast. Many of these researchers gathered for meetings of the Teleological Society at Princeton and the Ratio Club in England. Most researchers hope that their work will eventually be incorporated into a machine with general intelligence (known as strong AI), combining all the skills above and exceeding human abilities at most or all of them. A few believe that anthropomorphic features like artificial consciousness or an artificial brain may be required for such a project.

Keyword: Artificial Intelligence, physically disabled, car driving,

INTRODUCTION

The video and thermo gram analyzer continuously monitor activities outside the car Once the driver (disabled) nears the car. The security system of the car is activated. Images as well as thermo graphic results of the driver are previously fed into the database of the computer. If the video images match with the database entries then the security system advances to the next stage. Here the thermo graphic image verification is done with the database. Once the driver passes this stage the door slides to the sides and a ramp is lowered from its floor. The ramp has flip actuators in its lower end. Once the driver enters the ramp, the flip actuates the ramp to be lifted horizontally. Then robotic arms assist the driver to his seat. As soon as the driver is seated the EEG (electroencephalogram)helmet, attached to the top of the seat, is lowered and suitably placed on the driver's head. A wide screen of the computer is placed at an angle aesthetically suitable to the driver. Each program can be controlled either directly by a mouse or by a shortcut.

For starting the car, the start button is clicked. Accordingly the computer switches ON the circuit from the battery to the A.C.Series Induction motors.

2 .BIOCONTROL SYSTEM

The bio control system in tegratessignals from various other systems and compares them with originals in the database.

It comprises of the following systems:

- Brain-computer interface
- Automatic securitysystem
- Automatic navigation system

Now let us discuss each system in detail.

2.1 BRAIN–COMPUTERINTERFACE

Brain-computer interfaces will increase acceptance by offering customized, intelligent help and training, especially for the non-expertuser. Development of such aflexible interface paradigm raises several challenges in the areas of machine perception and automatic explanation. The teams doing research in this field have developed a single-position, brain-controlled switch that respond s to specific patterns detected inspatiotemporal electro encephalograms(EEG) measured from the human scalp. We refer to this initial design as the Low- Frequency

Asynchronous Switch Design (LF-ASD)

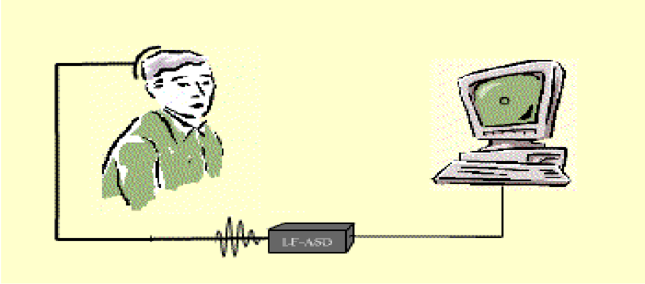

Fig.1LF-ASD

The EEG is then filtered and run through a fast Fourier transform before being displayed as a three dimensional graphic.

The data can then be piped into MIDI compatible music programs. Furthermore, MIDI can be adjusted to control other external processes, such as robotics. The experimental control system is configured for the particular task being used in the evaluation. Real Time Workshop generates all the control programs from Simulink models and C/C++ using MS Visual C++ 6.0. Analysis of data is mostly done within Mat lab environment.

FEATURES OF EEG BAND

Remote analysis data can be sent and analyzed in real-time over a network or modem connection. Data can be fully exported in raw data, FFT & average formats. Ultra low noise balanced DC coupling amplifier. Max input 100microV p-p, minimum digital resolution is100 micro V p-p / 256 = 0.390625 micro V p-p. FFT point can select from 128 (0.9375 Hz), 256 (0.46875 Hz), 512 (0.234375 Hz resolution).Support for additional serial ports via plug-in boar; allows extensive serial input & output control. Infinite real-time data acquisition (dependent upon hard drive size).Real-time 3-D & 2-D FFT with peak indicator, Raw Data, and Horizontal Bar displays with Quick Draw mode. Full 24 bit color support; data can be analyzed with any standard or user. Customized color palettes; color cycling available in 8 bit mode with Quick Draw mode. Interactive real-time FFT filtering with Quick Draw mode. Real-time 3-D FFT (left, right, coherence and relative coherence), raw wave, sphere frequency and six brain wave switch in one OpenGL display. Full Brainwave driven Quick Time Movie, Quick Time MIDI control; user configurable. Full Brain wave driven sound control, support for 16 bit sound; user configurable Full image capture and playback control; user configurable.

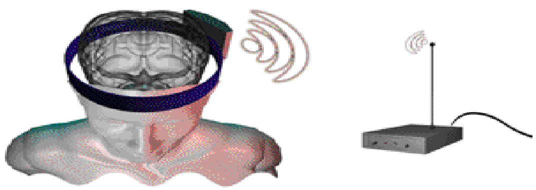

Fig. 2: EEG Transmission

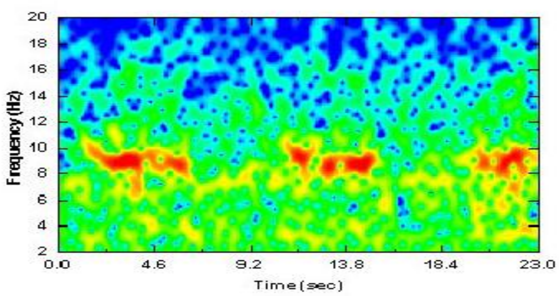

Fig. 3 EEG

2.2. TEST RESULTS COMPARING DRIVERACCURACY WITH/WITHOUT BCI

1. Able-bodied subjects using imaginary movements could attain equal or better control accuracies than able-bodied subjects using real movements.
2. Subjects demonstrated activation accuracies in the range *of* 70-82% with false activations below *2*%.
3. Accuracies using actual finger movements were observed in the range 36-83%
4. The average classification accuracy of imaginary movements was over *99*%

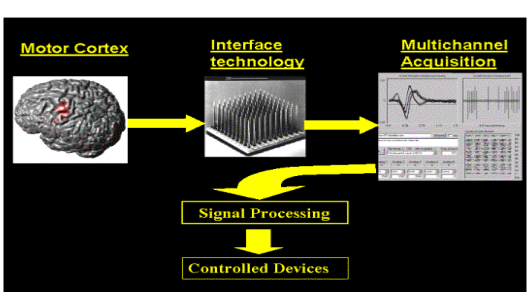

Fig.4Brain-to-MachineMechanism

The principle behind the whole mechanism is that the impulse of the human brain can be tracked and even decoded. The Low-Frequency Asynchronous Switch Design traces the motor neurons in the brain. When the driver attempts for a physical movement, he/she sends an impulse to the motor neuron. These motor neurons carry the signal to the physical components such as hands or legs. Hence we decode the message at the motor neuron to obtain maximum accuracy. By observing the sensory neurons we can monitor the eye movement of the driver.

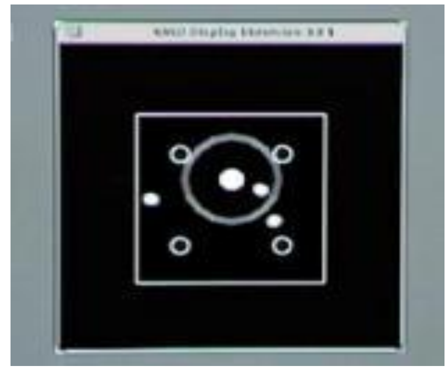

Fig.5EyeballTracking

As the eye moves, the cursor on the screen also moves and is also brightened when the driver concentrates on one particular point in his environment. The sensors, which are placed at the front and rear ends of the car, send a live feedback of the environment to the computer. The steering wheel is turned through a specific angle by electromechanical actuators. The angle of turn is calibrated from the distance moved by the dot on the screen.

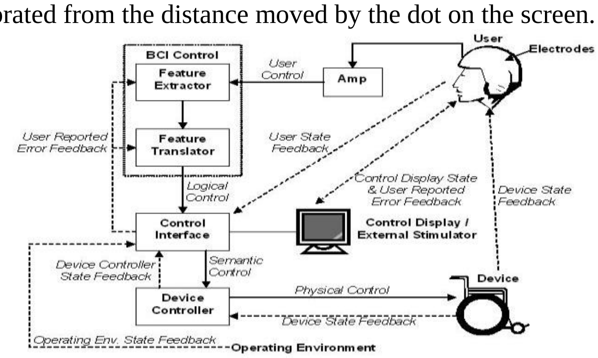

Fig.6ElectromechanicalControlUnit

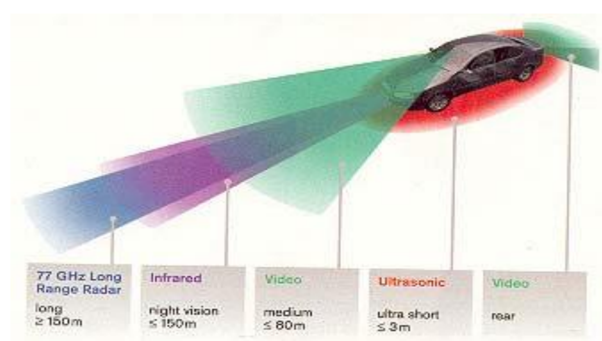

Fig.7SensorsandTheirRange

2.3. AUTOMATIC SECURITY SYSTEM

The EEG of the driver is monitored continually. When it drops less than 4 Hz then the driver is in an unstable state. A message is given to the driver for confirmation to continue the drive. A confirmed reply activates the program automatic drive. The computer prompts the driver for the destination before the drive.

2.4.AUTOMATIC-NAVIGATION SYSTEM

As the computer is based on artificial intelligence it automatically monitors every route the car travels and stores it in its map database for future use. The map database is analyzed and the shortest route to the destination is chosen. With traffic monitoring system provided by *xm satellite radio* the computer drives the car automatically. *Video and anti-collision sensors* mainly assist this drive by providing continuous live feed of the environment up to*180 m*, which is sufficient for the purpose.

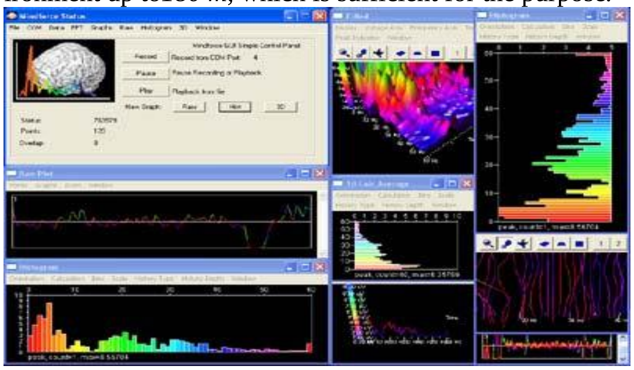

Fig.8EEGAnalysisWindow

3. CONCLUSION

When the above requirements are satisfied and if this car becomes cost effective then we shall witness a revolutionary change in the society where the demarcation between the abler and the disabled vanishes. Thus the integration of bio electronics with automotive systems is essential to develop efficient control.

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5. "The brain response interface: communication through visually-induce electrical brain responses" Sutter, E.E., Journal of Microcomputer Applications, 1992, 15: 31-45. Futuristic vehicles, which shall be witnessed soon the disabled in every manner in the field of transportation.

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